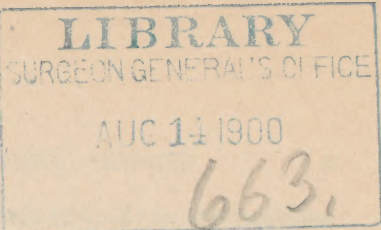


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## TREATMENT OF CLUB-FOOT—WITH REPORT OF SIX CASES.\*

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It may appear to many of our professional brethren that the presentation of so old a topic as the treatment of club-foot will be only a repetition of methods of procedure well established and practised with variations in accordance with modern surgery. Those of us who have opportunities of seeing numerous cases of this altogether preventable deformity will admit that no apology is needed for again bringing forward this much discussed subject. When one takes into consideration the numerous methods that have been introduced for the correction of this deformity, each one in turn to be abandoned for the adoption of something new, it can be readily appreciated that we have not yet discovered a method that will give perfect results in every case in the hands of the general practitioner.

Club-foot braces have been used for centuries and still we see uncorrected club-feet in great numbers. Probably club-foot braces are more numerous than any other orthopedic appliance. Nearly every orthopedic surgeon has a brace of his own that he thinks the best, and he has reason for so thinking; for the best brace is the one that gives the best results, and this will follow in the hands of him who knows best how to use it. The writer has been so much discouraged of late in the use of club-foot braces that he has discarded them together as an implement of correction, and uses a brace only as a means of preventing relapse of the deformity after it has been corrected by means to be described later.

The writer fully agrees with Dr. Phelps, who says that "traction machines should never be used as an implement of correction, for there never was a traction brace made equal to the human hand." When the foot has been manipulated into an improved position, the gain can be maintained by means of a plaster-of-Paris case, and this process can be painlessly repeated from time to time until the desired over-correction is obtained.

The treatment of club-foot must necessarily vary according to the age of the patient and the degree and variety of the deformity to be corrected. It should be by either manipulative, mechanical or operative measures. The object should be to

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over-correct, as there is always a tendency to relapse, and then use some mechanical appliance to retain the foot in an over-corrected position sufficiently long to render any return of the deformity impossible. Bradford and Lovett say: "The treatment of club-foot requires:

1st. A rectification of the misplaced bone and a lengthening of the shortened and contracted tissues.

2d. A retention in a normal position until the abnormal facets of the astragalus and the other tissues become, under the pressure of the new position, normal."

When I am asked as to the best time to correct a club-foot, my reply is do it on sight, regardless of the age; do it at once, let the child be one hour old or ten years old. Dr. Phelps, in a recent article on this subject, says begin the treatment just as soon as the third stage of labor is over and you are assured the mother is in no danger of post-partum hemorrhage. I would begin even a little earlier than that were I the accoucheur at the birth of a club-foot child being born feet foremost—in such a case I would begin to manipulate the feet into a normal position while waiting for the child's body to be delivered.

There is a great diversity of opinion among surgeons as to the best method of treating infantile club-foot, some depending almost entirely on operative measures, while others depend entirely upon non-operative procedure. My experience has convinced me that cutting tendons, fasciæ, etc., in a child under three years of age is not only unnecessary but is much inferior to non-operative intervention in bringing about permanent results. Even up to ten or twelve years of age, I much prefer manipulation and gradual redressment, with some retentive appliance in the case of slight degree of deformity.

No time should be lost in beginning the treatment, for the longer the bones are allowed to remain in their distorted position, the more firmly will they be fixed in their false position. Just as soon as the child begins to bear weight on its feet in walking, the deformity will increase very rapidly, which will add to the difficulties of the treatment.

My experience has taught me that every case of club-foot is a law unto itself and that the treatment must be guided by the age of the patient and the degree of deformity to be corrected. In a young baby I have yet to see a case in which the foot cannot be brought into a correct position by manipulation. In slight cases, after this has been accomplished the foot can be held in an over-corrected position by means of a number of adhesive strips applied spirally around the leg and foot. If the adhesive plaster causes irritation of the skin, this can be



prevented by first covering the foot with a gauze bandage. Cases that cannot be easily held in position by adhesive strips should be held in position by means of plaster of Paris.



FIG. 1—CASE I. Double equino-varus. Before operation.

In severe cases do not attempt to correct all of the deformity at first sitting; but hold the foot in an improved position by plaster of Paris and repeat the process at short intervals, gaining some-



thing in the way of correction each time. Continue this process until the foot is in an over-corrected position—convert the deformity of equino-varus into just the opposite deformity, that is, calcaneo-valgus. When this has been accomplished put the foot up in a permanent case made of a silicate of soda bandage. This being almost impervious to moisture will last for months and will allow the child to walk, thus utilizing the body weight of the child at each step to stretch the faulty tendons and ligaments, and at the same time it will press the abnormally shaped bones into a normal position.

So much for the milder cases in infants before they begin to walk. After a child has walked for a few months on a distorted foot these simple methods will not be sufficient to reduce the bones that have become misshapen; more leverage will be required than can be easily obtained by the hand alone. In this class of cases it is intended to include the deformed feet that can by gradual redressment be over-corrected without aid of operative procedure. For the past six years the writer has with perfect satisfaction adopted the Wolff method. It is much the wisest plan not to attempt to reduce any of the deformity at the first sitting, for if you cause any pain the child will be very much frightened and you will not be able to gain its confidence. Cooperation of the patient is a very important element in the treatment. Pain is more apt to be produced at the first two or three sittings than later; the amount of twisting all through the treatment should be regulated by the amount of pain that is produced. If great care is exercised and the twisting is very gradually done, no pain is produced. Frequently it has been my good fortune to correct marked deformities and never once have the child complain of pain.

Wolff's method of applying the plaster and the treatment is as follows: First, apply a piece of cotton felt to both the outer and inner borders of the foot, extending it over the malleoli. This is done as an extra precaution for the protection of the bony prominences, being needed especially over the metacarpophalangeal joint of the great toe, and over the cuboid bone—the latter being usually very prominent. Then apply snugly at least two thicknesses of a canton flannel bandage to the foot and leg, extending it up as far as the tuberosity of the tibia. Now, having the foot and leg well protected, the plaster is applied, extending it also up to the tuberosity of the tibia. This will prevent the leg from moving in the plaster case and give a better leverage when the redressment is begun. Two ordinary-sized plaster bandages will be found quite sufficient for a foot and leg of a child six or eight years old. Care should be taken



to have the toes held in their natural relation to each other; otherwise you will have an uneven pressure, and, as a result,



FIG. 2.—CASE I. After operation.

swelling and pain. The plaster should extend well over the toes, leaving their ends exposed. Then grasp the leg with one



hand, holding it steady on the table, and with the other make pressure on the plantar surface of the foot with a small piece of board. This serves the purpose of overcoming some of the deformity, and, at the same time, will give an even surface upon which the child can walk.

On the following day, begin the redressment by cutting out a wedge-shaped piece of the plaster on the outer border of the foot, selecting the point most prominent in the deformity, for there is where the pressure is most needed; then connect the upper and lower angles of this cut by cutting a line through the plaster only around the foot. Care should be taken not to have this linear cut around the foot near enough to the heel to allow the foot to slip in the dressing when it is twisted, and thereby defeat the object in view.

The plaster case is now in two parts, each firmly fixed to the foot. Now, by grasping the leg with one hand and the end of the foot with the other, it takes but little force with this leverage to bring the opposite sides of the wedge-shaped incision into apposition and thereby overcome a certain amount of the deformity. While an assistant holds the parts in their new relation to each other, they are fixed there with another wet plaster bandage applied around the foot and ankle in a figure of eight, care being taken to fill well the gap made by the linear incision on the inner side of the foot. The third bandage being applied on a dry surface, it can be easily peeled off at the next sitting; then make the wedge-shaped incision larger, and repeat the redressment as before.

This can be repeated three or four times, when it will become necessary to apply an entirely new dressing. Great care should be taken lest you get compressed, between the edges of the plaster when forced together, a fold of loose skin, in which case a bad excoriation will result. This was learned by experience, for in one of my cases, not only the operation had to be suspended, but, the excoriation becoming infected, quite an extensive cellulitis followed, which gave some trouble in healing.

The number of sittings will have to be regulated by circumstances, pain, etc. The condition of varus should be corrected first, after which the equinus can be corrected by making the wedge incision on the dorsum of the foot, and the linear incision over the heel, so as to allow the tendo Achillis to be stretched. If much pain is complained of, which is likely to occur only at some of the bony prominences, it can be readily relieved by cutting out a fenestrum, thereby relieving the painful pressure.

The treatment should be continued until the foot is somewhat over-corrected, and then Wolff advises that it be held there by



means of a plaster case protected by silicate of soda, and, incorporated in the plaster, a piece of light steel extending from the ball of the foot above the heel. A piece of steel one-half inch wide and as thick as the blade of a case knife will be found quite sufficient. Then fit a shoe over this case, which is allowed to remain at least six months.

A full description of this method, with report of nine cases, ages varying from four to nine years, treated by it, was published by the present writer in the *Virginia Medical Monthly*, September, 1894. Since that time numerous cases have been treated by the same method with equally as satisfactory results.

This brings us, in treating this subject as a whole, to deal



FIG 3—CASE II Before operation.

FIG. 4—CASE II. After operation.

with a class of cases which cannot be corrected by gradual redressment alone, but where it has to be combined with operative measures, which will consist of subcutaneous tenotomies and fasciotomy, open operations and tarsiectomies, resections, etc.

One who is accustomed to treating club-feet should have no trouble in deciding what course to pursue in any given case. The milder cases requiring the knife can be corrected by dividing subcutaneously the contracted tendons and fasciæ that are responsible for the deformity. Another class of cases that require more heroic procedure are those of long standing in which the tarsal bones—principally the astragalus—have developed an abnormal shape. The most important point to keep in mind in dealing with an extreme case of club-foot is that it should be over-corrected before you leave it. First divide sub-



cutaneously all of the contracted tendons and bands of contracted fascia. If the condition of inversion cannot then be overcome, divide by open operation all of the shortened tissues in the plantar surface of the foot. This is commonly known as Phelps' operation. It has the great advantage of lengthening the inner border of the foot, and, unless it is a case in which the astragalus is very much distorted, it will permit the foot to be easily brought into an over-corrected position. If this cannot be done, then don't rest satisfied until such has been done.

The next step necessary then will be the removal of the astragalus; and even then there are some cases in which the foot cannot be brought around properly on account of the cuboid bone impinging against the external malleolus. When such is the case, saw off enough of the tip of the malleolus to overcome this obstruction. This I have repeatedly done with the most satisfactory results. After the foot has been brought into a satisfactory position apply aseptic dressings and put the foot up in a well fitting plaster-of-Paris case, care being taken that the foot is resting in an easy position; for if such is not the case the patient will suffer much pain, and the chances are that the circulation will be obstructed at some point, which may cause serious trouble. As a retentive apparatus the writer has seen nothing equal to the silicate of soda bandage, keeping the foot in position during convalescence, and it should be kept on for six months if so long a time is deemed advisable. If it is snugly applied a shoe can be worn over it and patient can walk very well. If this is worn for a proper length of time there is little prospect of a relapse after it is left off.

In the extreme adult cases the chief difficulty in restoring the foot to a normal relation to the vertical axis of the leg arises from the abnormal shape of the astragalus and the subluxation of the cuboid and scaphoid. In these cases the anterior part of the upper articular surface of astragalus is too broad to be forced back between the malleoli. In these cases it is absolutely impossible to correct the foot without the removal of bone, and this one should never hesitate to do, for when judiciously executed the results are perfectly satisfactory. The cases here reported that required the removal of the astragalus are about as severe as any that are encountered, and the results obtained as to functional use are about as good as the photographs show them to be, viewed from a cosmetic standpoint. It is not claimed that these patients walk with a perfectly normal gait, but it is claimed that the limp they have is due more to the weak—i. e., partially paralyzed and non-developed—muscles than to the foot.



The extreme cases, when not due to partially paralyzed muscles, walk with scarcely a perceptible limp after the foot has been corrected.

(1) Can club-feet be cured? (2) Can a perfect foot be obtained by treatment? These are questions which we always have to encounter when treatment is advised.

The first of these questions can always be answered in the affirmative if the parent will consent to the surgeon's taking entire charge of the case, and if hearty co-operation is given during the entire course of the treatment, provided of course that the surgeon is entire master of the situation and that he adopts the method best suited to the individual case and faithfully carries



FIG. 5—CASE III. Before operation.

FIG. 6—CASE III. After operation.

it out in the most minute detail to the end, never for once relaxing his determination until he is assured there is no danger of a relapse. The length of time to continue the treatment, and the method to be adopted, will depend upon the degree of deformity present and whether it is due simply to contracted tendons and fascia alone, or whether complicated with long-standing distortion.

When due to contracted tendons and fascia alone, a perfect result can be promised; otherwise the foot can be made perfectly useful for locomotion, but it will not be perfect in appearance. It is the duty of the surgeon to impress on the parents that a relapse, especially in a growing child, is a likely event and that to obtain the best results the child must be brought back for

examination from time to time. A perfect foot can be obtained in the slighter degrees of deformity, and a perfectly useful foot can be obtained in the severe cases but it may be somewhat unsightly, which, however, is not of primary importance.

It has not been considered necessary, in a paper of this kind, to describe in minute detail the procedure of operative intervention, as such operations are attempted only by those that are already familiar with the technic.

All that has been said by the writer in this paper has reference to the most common form of club-foot—equino-varus. Before closing, something must be said about that rarer form of club-foot—talipes calcaneus, a form that has generally been regarded as intractable. This is the form of club-foot in which the heel is depressed, owing to a paralysis of the muscles of the posterior aspect of the leg. Here the tendons and muscles are elongated. The form of paralysis causing this trouble is known technically as anterior poliomyelitis, or, as it is commonly called, infantile paralysis.

The prognosis in average cases of talipes calcaneus as to overcoming the deformity is bad in the extreme, but thanks to modern surgery, much can be done wonderfully to improve the locomotion of these unfortunate patients. Here we have a relaxed tendon and muscles at the back of the leg, which allows a contraction of the plantar muscles, causing a shortening of the plantar arch, and as a result giving us a condition of cavus or hollow foot, complicating the calcaneus, producing a condition of talipes calcaneo-cavus. This contraction is well shown in the photograph of the typical cases here reported.

The treatment of these cases should be to give the patient better use of the foot, which can be done by mechanical support, by means of a brace made with lateral steel bars, with a limited joint at ankle, attached to a foot plate which is worn inside the shoe. While this support, when properly applied—and I say this advisedly, for often our ingenuity is sorely taxed to get the brace properly adapted—gives very great relief in improving locomotion, a great deal more can be done by operative procedure previous to applying the mechanical support.

In 1880, Mr. Alfred Willet, of the St. Bartholomew Hospital, London, reported three cases operated on by him by a method that has since been known as Willet's operation. The operation, as described and practised by Dr. V. P. Gibney, of New York, is as follows: "A Y-shaped incision is made with the stem of the Y toward the os calcis. The incision is continued down to the tendon. Then resect about one-half of an inch of this tendon and by sharp extension of the foot the proximal and distal ends



of the tendo Achillis are approximated and sutured. Foot is the put up in a plaster of Paris case in extreme extension."

Dr. Gibney reported a series of thirty-nine cases in *Annals of Surgery*, 1890, operated on by him after the Willet method. He closes his report with the following resumé: "There were 16 males and 12 females, making a total of 28 patients that were traced. Of this number 17 had a good result, 8 a fair result, and 3 a poor result. By 'good' is understood ability to walk with foot squarely on the floor, not striking the heel first and to walk without the aid of an apparatus."

Within the last five years the operation of tendon grafting



FIG. 7—CASE IV. Before operation.

FIG. 8—CASE IV. After operation.

for relief of this condition has been very generally adopted and with results far superior to those following Willet's operation. The idea of reinforcing paralyzed muscles by grafting on to them the tendon of a neighboring healthy muscle originated with Nicoladoni. Dr. Goldthwait, of Boston, has reported quite a number of cases in which he has practised tendon grafting with most gratifying results. The writer has been convinced by his experience with this operation that it is by far the best procedure that has yet been introduced for relief of this condition. It does not improve the appearance of the foot to a great extent, but it does undoubtedly give the patient better use of the foot, enabling him to walk much better and with

less fatigue. The operation will be described in the report of the typical case here given.

The cases here reported are given as a few examples of the many that have been treated by the writer by the different methods as described above.

CASE I.—Age four and a half years. Diagnosis: Double equino-varus. Stands on outer borders of both feet with about 45 degrees of inversion of the left foot and about 25 degrees of inversion of the right. (Fig. 1.) This is a case of congenital deformity. Has had no treatment. Mother says that she has noticed that the child has grown rapidly worse within past six months. By gentle manipulation, with but little force, about one-half of the deformity can be corrected, which relapses at once when the pressure is removed. It was decided that this was a case suitable for correction by the Wolff method, consequently, treatment was begun at once on both feet. The deformity of the right foot was corrected at four sittings; the left at eight sittings. Both feet were put up, in an over-corrected position, in a silicate of soda bandage and this was allowed to remain on for three or four months. (Fig. 2.)

CASE II.—Age 24 years, female. History of this patient in brief is that when about five years old she had anterior poliomyelitis, which left the peroneal group of muscles paralyzed. Within about two years it was noticed that the foot began to be inverted and the heel elevated, which increased with the additional weight of growth until the present deformity (Fig. 3) was established, about the time of adolescence. The deformity was due entirely to contraction of tendons and plantar fascia. Under ether anesthesia the tendo Achillis, tendon of the tibialis anticus muscle, and plantar fascia were divided subcutaneously. The foot was by manual force put in an over-corrected position and secured there by means of a plaster-of-Paris case which remained on three weeks. This patient's foot was examined two years after the operation and found to be in the position represented in Fig. 4.

CASE III.—Age 16 years, male. History of this case is similar to that of CASE II. He had poliomyelitis at two years of age, but deformity did not begin to be very manifest until he was about ten years old. There was scarcely any inversion of the foot in this case; deformity was an exaggerated equino-cavus, or hollow foot, which is well represented in Fig. 5. Under chloroform anesthesia the tendo Achillis was subcutaneously divided and Phelps' operation done for the correction of the hollow due to contraction of all of the plantar structures, includ-



ing the tibialis anticus tendon. The incision was made in the usual place from just in front of the internal malleolus about two-thirds across the sole of the foot, dividing every structure, one after the other, that prevented the proper correction of the deformity. The plantar wound was left open to heal by granu-



FIG. 9.—CASE V. Double equino-varus (congenital).

lation, and was dressed on alternate days through a fenestrum in the plaster of Paris that held the foot in an over-corrected position. In about four weeks the wound was healed; plaster was then left off and patient allowed to bear weight on the foot. This patient was kept in bed only for forty-eight hours, after which he was allowed up and around on crutches, coming to

my office to have the wound dressed. He never for once complained of pain, and in six weeks after the operation was able to discard crutches and to begin attending school. (Fig. 6.)

CASE IV.—Age 16 years, male. Diagnosis extreme equinovarus. (Fig. 7.) This case was also a deformity following anterior poliomyelitis which left the peroneal group of muscles paralyzed. Under a general anesthetic the plantar fascia and tendo Achillis were subcutaneously divided, after which not more than one-half of the deformity could be corrected, using all of the manual force I could. At once it was decided to remove the astragalus in order to accomplish what was desired,



FIG. 10—CASE VI. Talipes calcaneus.

viz., an over-correction of the foot. The astragalus was removed through the usual incision. The wound was closed without drainage, sterile dressing applied and foot put up in plaster-of-Paris case, which was removed at end of three weeks. Primary union followed. The result of the operation is well shown in Fig. 8.

CASE V.—Age 17 years, male. Diagnosis: Congenital equino-varus of both feet. Right foot inverted to a right angle at the medio-tarsal joint; patient walks on outer half of the dorsum of the foot, with heel elevated two inches. Left foot inverted to an angle of 45 degrees from the normal. (Fig. 9.) A subcutaneous division of the tendo Achillis and plantar fascia



was made; the astragalus removed and tip of external malleolus sawn off, after which the foot was easily placed in an over-corrected position. Foot put up in plaster of Paris. Primary union resulted. The left foot was corrected by subcutaneous division of the tendo Achillis and plantar fascia. This patient refused to allow a photograph to be taken after treatment. The results secured, however, were equal to those in the other cases here reported.

CASE VI.—Age 13 years, female. Diagnosis: Talipes calcaneus. This deformity is the result of infantile paralysis, which left the gastrocnemius muscle paralyzed. The resulting deformity is well shown in Fig. 10, from a photograph of a plaster cast of the foot. A large V-shaped incision was made exposing the tendo Achillis, which is non-developed, and the peroneus longus tendon, which was then grafted to the tendo Achillis about one inch above its attachment to the os calcis. The wound was closed and primary union resulted. Foot was put up in plaster of Paris in extreme plantar flexion. The plaster was removed in four weeks and a lateral-bar ankle brace was applied. The result in this case was very satisfactory, enabling the patient to walk with a much improved gait and with much less fatigue than before the operation, although very little of the deformity was corrected.

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